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C.T. Liu, M. Yen

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10 E. Saturn Blvd.
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Edwards AFB CA 93524-7048

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MEMORANDUM FOR PRS (In-House Publication)

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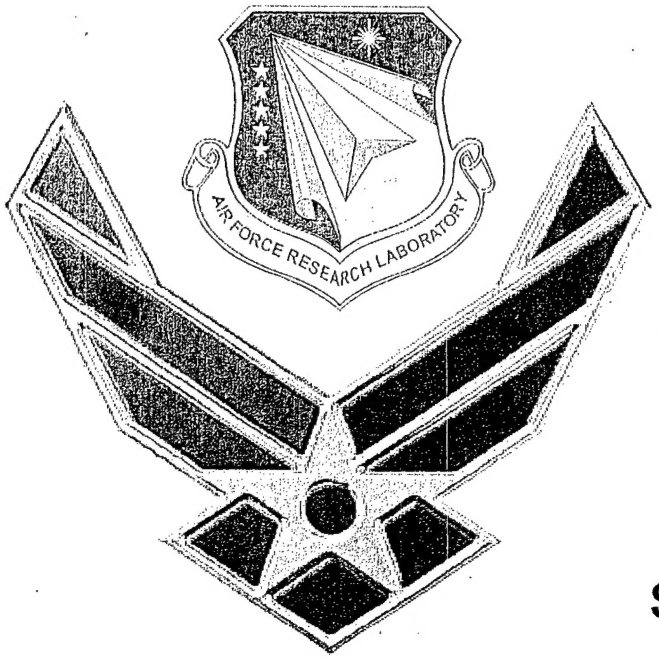
International Conference on Mechanical Behavior of Materials **(Statement A)**
(Geneva, Switzerland, 25-29 May 2003) (Deadline: 14 May 2003)

Investigating the Effects of Confining Pressure on Cumulative Damage and the Constitutive Behavior of a Particulate Composite Material



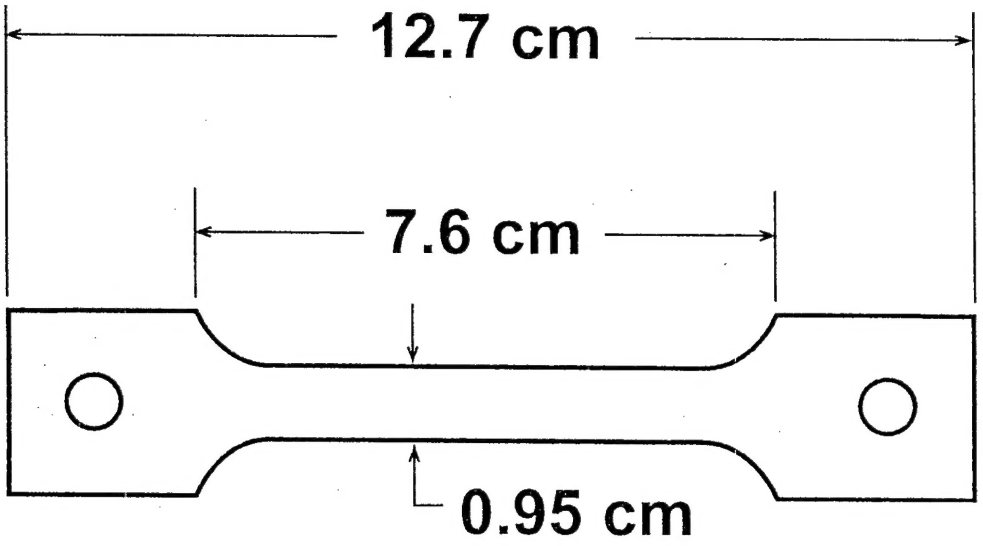
C.T. Liu
10 East Saturn Blvd.
Edwards AFB CA 93524

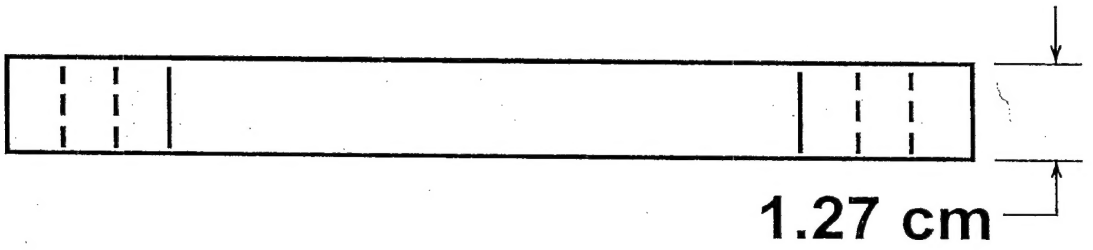
M. Yen
Material Technology Center
Southern Illinois University at Carbondale
Carbondale, IL USA

Objectives

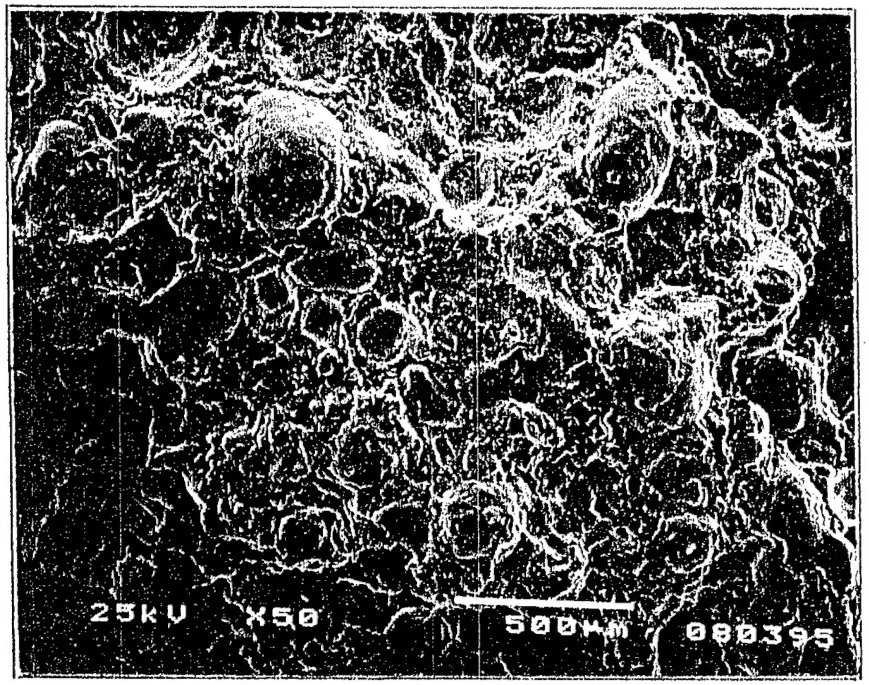
- **Investigate the Effects of Strain Rate and Confining Pressure on Cumulative Damage and the Constitutive Behavior of a Particulate Composite Material.**
  - **Strain Rates: 0.73 cm/cm/min, 18.18 cm/cm/min, and 72.73 cm/cm/min**
  - **Confining Pressures: Ambient and 1000 psi**

Specimen Geometry

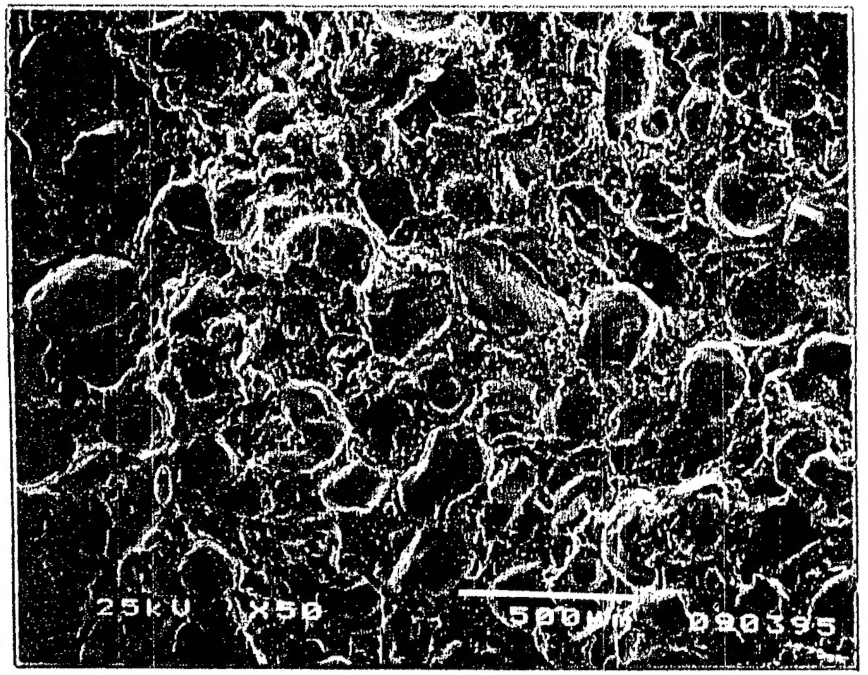




Fracture Surface Under Different Confining Pressures

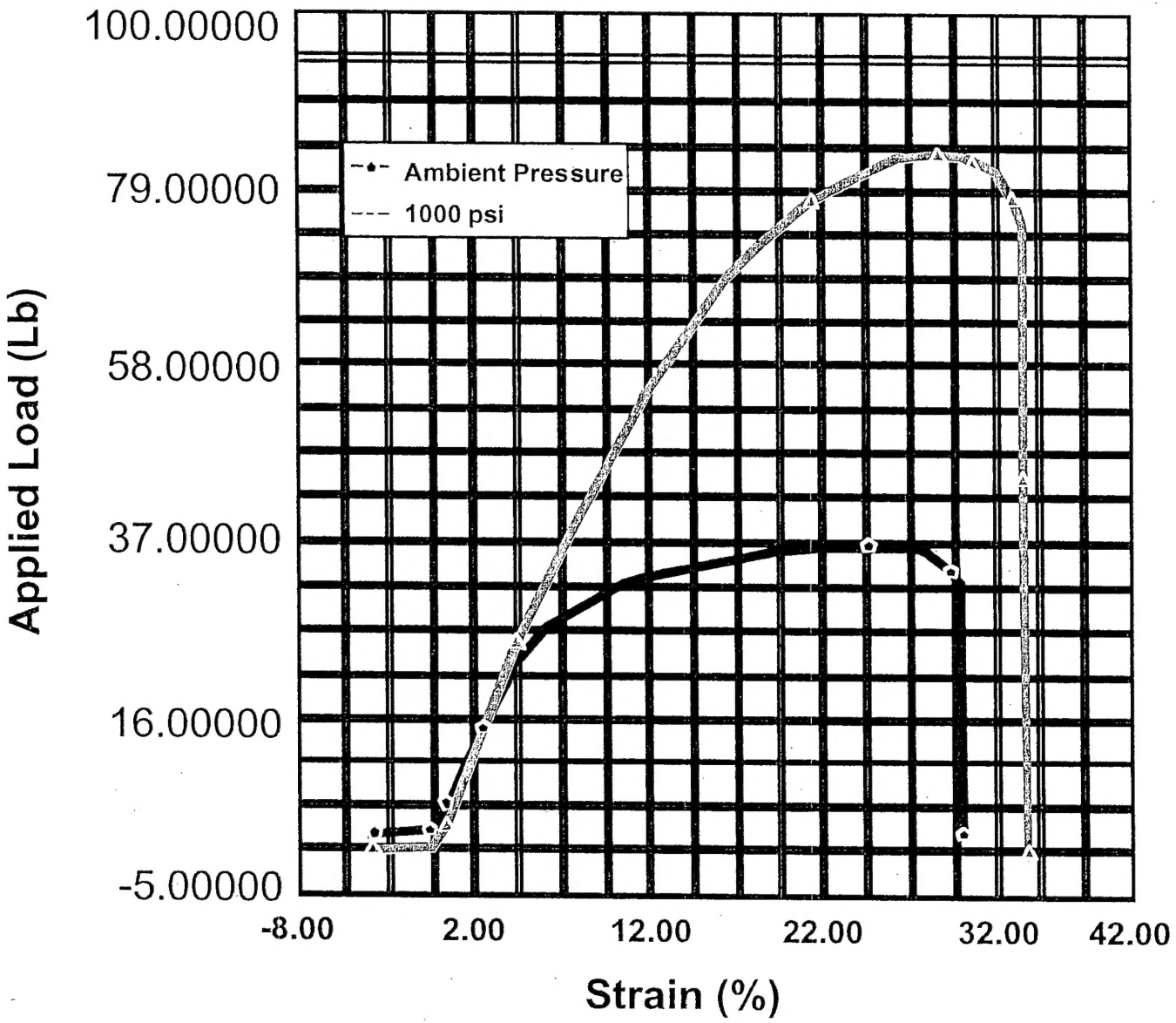


Pressure = 72.7 psi

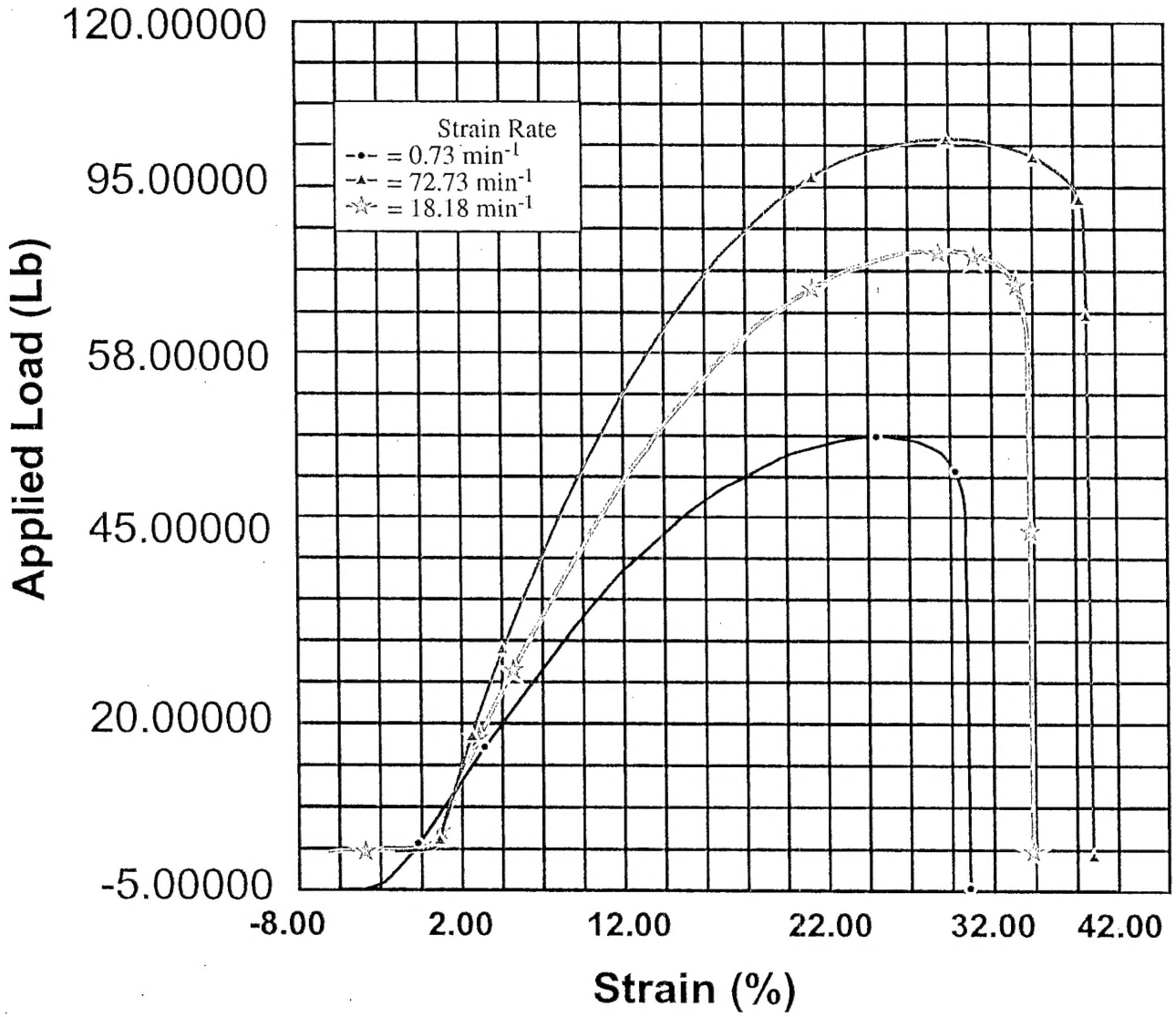


Pressure = 1744 psi

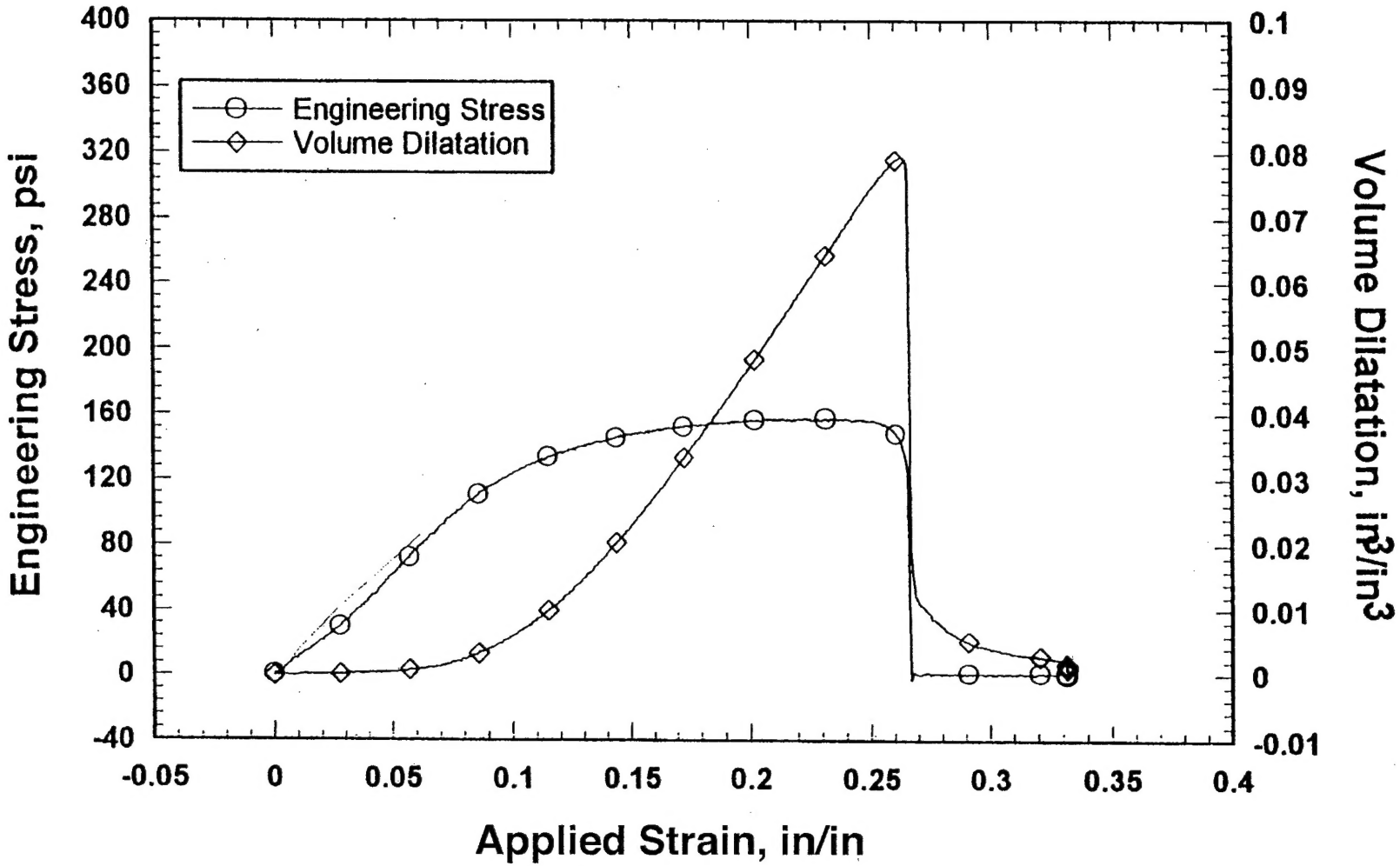
Applied Load Vs. Strain (Strain Rate=18.8 min^{-1})



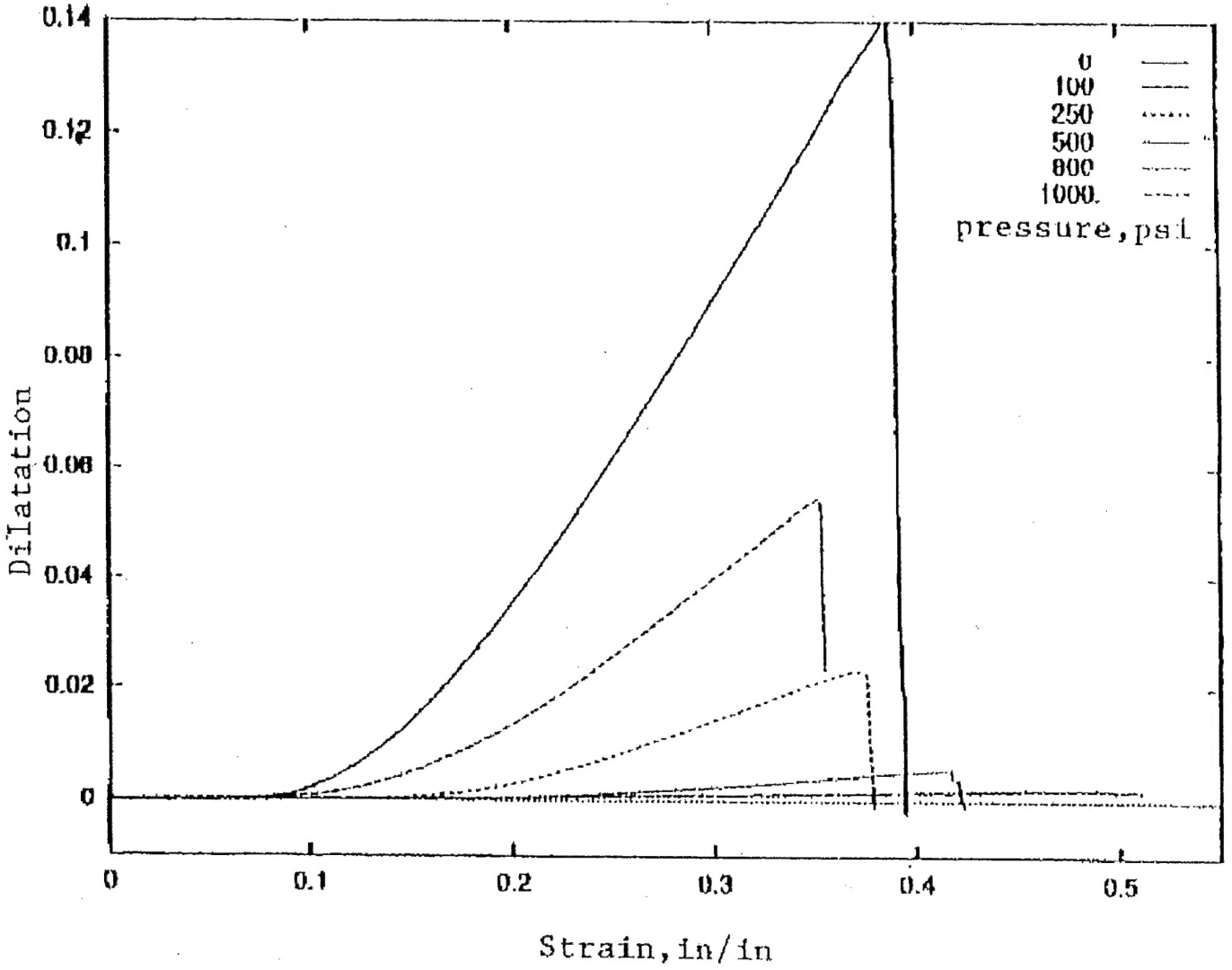
Applied Load Vs. Strain (Confining Pressure=1000 psi)



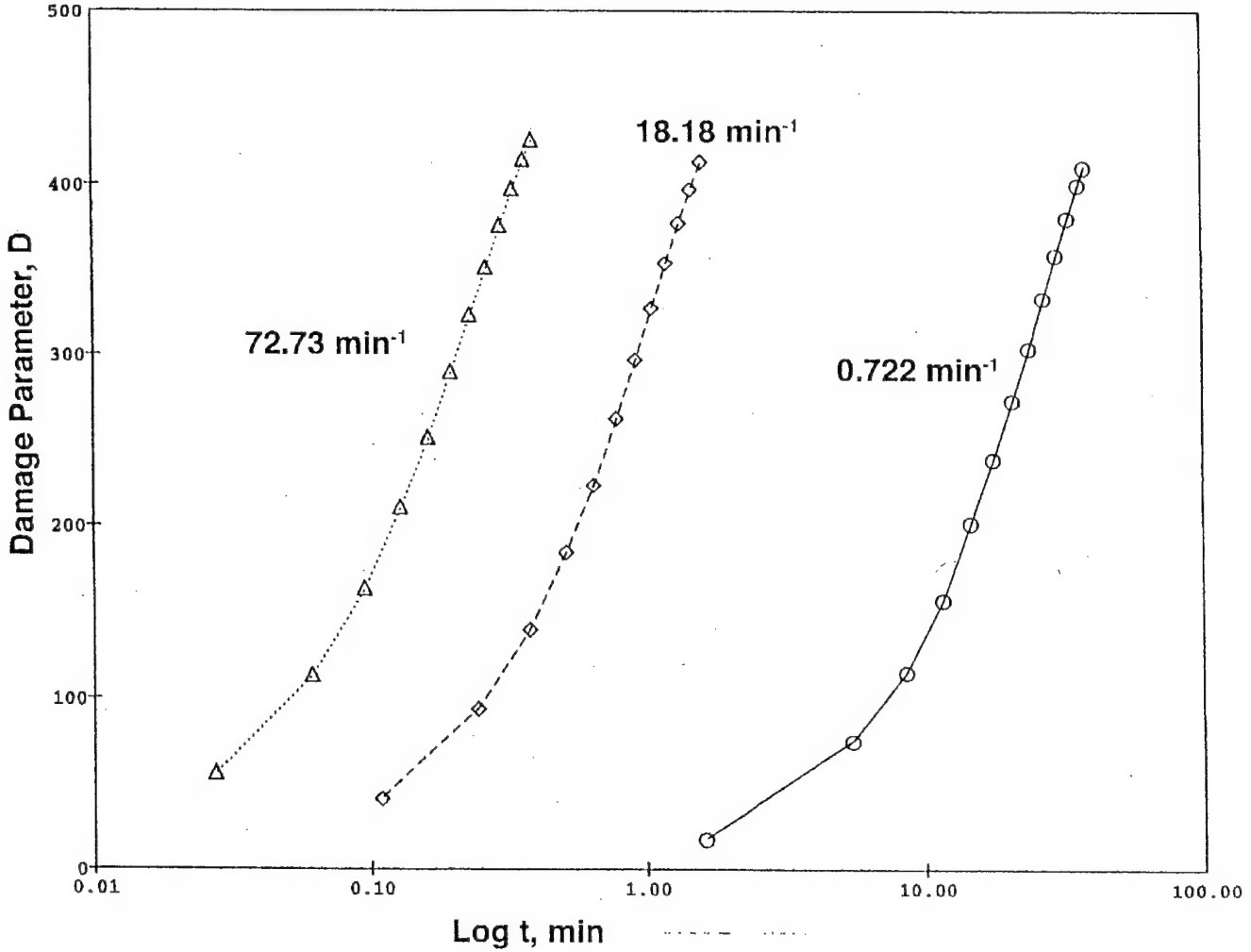
Engineering Stress and Volume Dilatation Vs. Applied Strain
(Strain Rate=0.73 min-1 and Ambient Pressure)



Volume Dilatation Vs. Confining Pressure

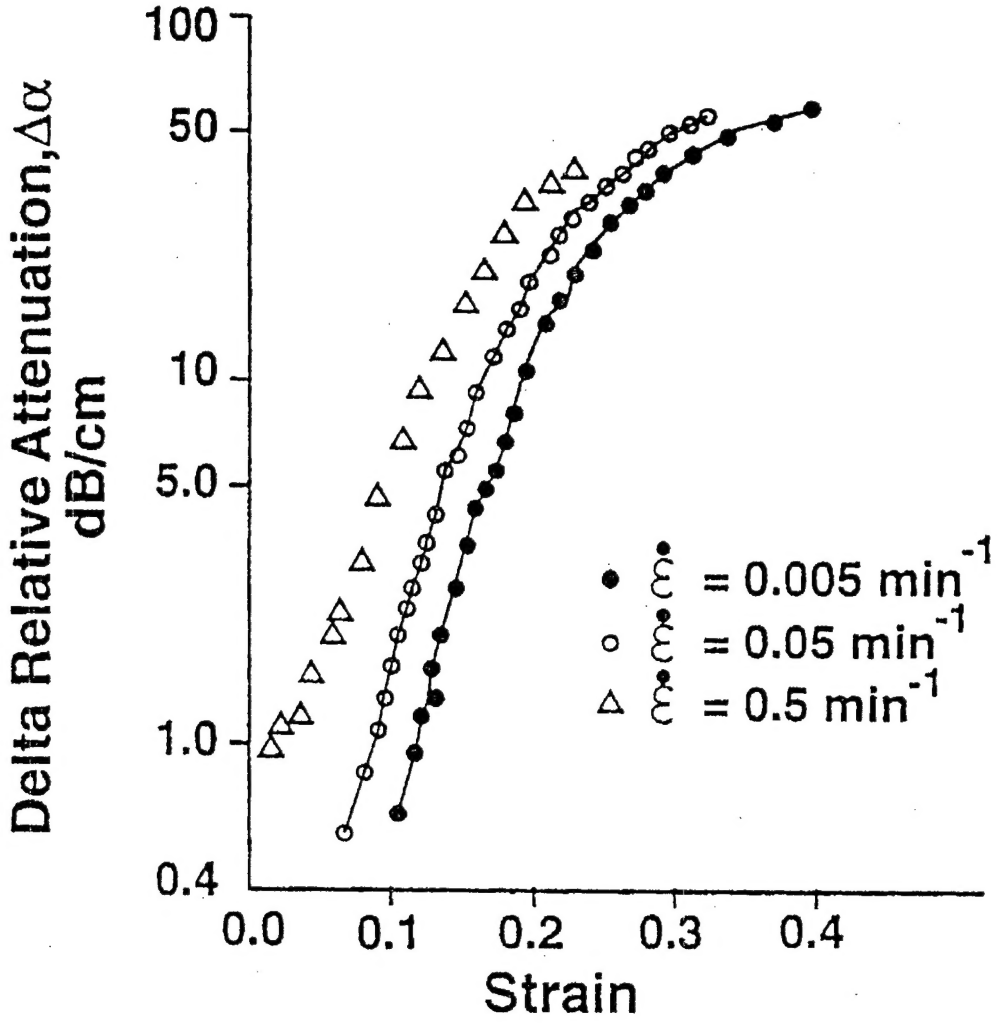


Damage Parameter Vs Time, semi-log scale



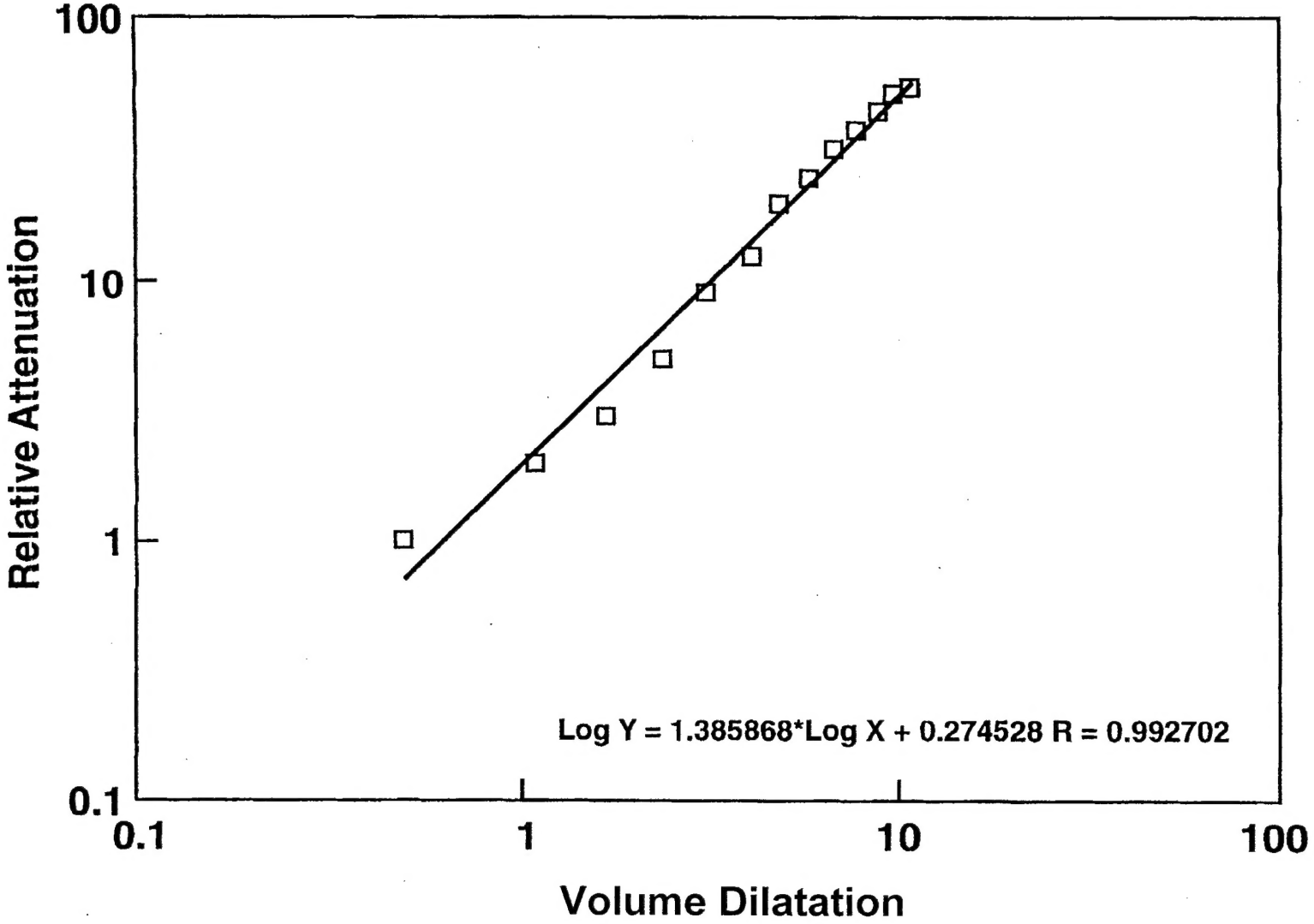
Relative Change in Acoustic Attenuation Versus Strain

(constant strain rate loading)



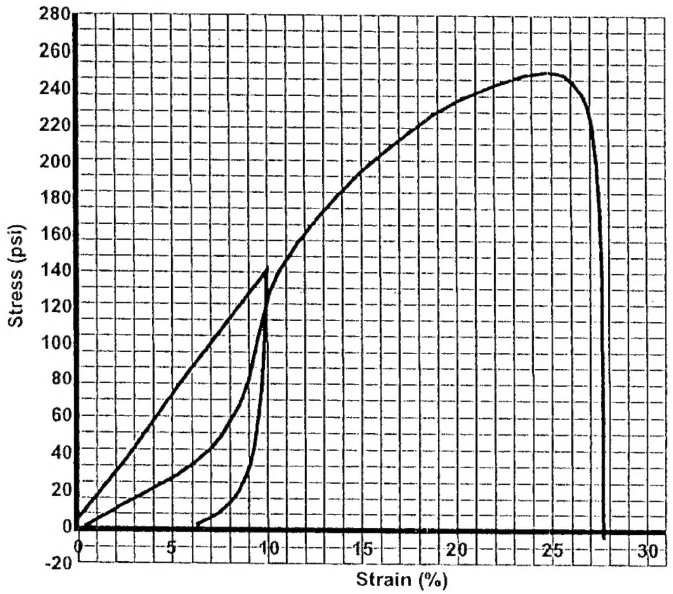
Relative Attenuation of Acoustic Energy Versus Volume Dilatation

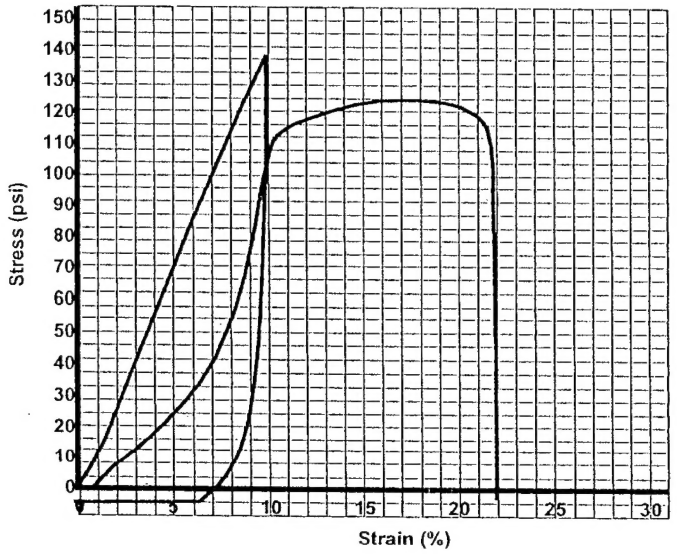
(monotonic loading)



Under A High Confining Pressure, Microcracks Can Develop in the Highly Filled Particulate Composite Material

- * The development of micro-cracks under multi-axial loading conditions results in a decrease in modulus.
- * For a given number of defects (micro-cracks or micro-voids), the modulus (volume dilatation) is insensitive (sensitive) to the type of defects.





Conclusions

- For a given strain rate, confining pressure has significant effects on the maximum stress and the applied strain for the onset of dilatation.
- For a given strain rate, confining pressure has no effect on the Modulus and insignificant effect on the rupture strain.
- For a given time, the strain rate has a significant effect on the damage intensity.
- The critical damage intensity is insensitive to the strain rate.